Bossier Parish Community College
Master Syllabus

Course Prefix and Number: CHEM 107 **Credit Hours:** 3

Course Title: Introductory Chemistry

Course Prerequisites: Math 098 or math ACT score of 19 or higher

Textbook: Denniston, K., Topping, J., and Caret, R.; General, Organic, and Biochemistry, 6th edition.

Course Description:

Fundamentals of inorganic chemistry for nursing, other allied health students and students needing only one year of college level chemistry. This course presents the basics of inorganic chemistry including scientific measurements and calculations, atomic structure, elements and compounds, ionic and covalents bonding, general chemical reaction recognition, stoichiometry, thermodynamics and kinetics, calorimetry, gases, solutions and concentrations, acids and bases, and fundamentals of nuclear chemistry.

Learning Outcomes:

At the end of this course, the student should will:

A. utilize algebraic skills to perform unit conversion and solve problems related to chemical concepts;
B. apply properties of chemicals to understand and predict physical and chemical reactions;
C. demonstrate the ability to apply concepts to the understanding of gases and solutions; and
D. apply critical aspects of nuclear chemistry to the allied health environment.

To achieve the learning outcomes, the student will:

1. demonstrate the symbols and be able to interconvert the common metric system prefixes mathematically. (A)
2. utilize standard the metric units for length, mass, volume, temperature, and various metric units. (A)
3. describe uncertainty in measurements and how to express it with significant figures. (A)
4. report data and results using scientific notation and the proper number of significant figures. (A)
5. convert from decimal to scientific notation and perform mathematical operations in scientific notation. (A)

6. use the equalities and conversion factors that relate the English and metric systems. (A)
7. use dimensional analysis as a general problem solving method. (A)
8. use appropriate experimental quantities in problem solving. (A)
9. calculate the density of an object from mass and volume data and calculate the specific gravity of an object from its density. (A)
10. state the significance of and relationship between density and specific gravity. (A)
11. convert temperature in the three different scales in common use. (A)
12. convert from calories to joules. (A)
13. recognize the three physical states of matter. (B)
14. recognize the interrelationship of the structure of matter and its chemical and physical properties. (B,C)
15. differentiate between intensive and extensive properties. (B,C)
16. determine if a change in matter is physical or chemical. (B,C)
17. recognize and differentiate the characteristics of pure substances and mixtures. (B,C)
18. categorize mixtures as homogeneous or heterogeneous. (B,C)
19. describe the internal structure of an atom with respect to arrangement of subatomic particles (protons, neutrons, and electrons) and be able to calculate the number of and the characteristics of each. (B)
20. recognize and demonstrate the relationship between atomic number, mass number, and isotopes. (B)
21. distinguish among atoms, ions, and isotopes. (B)
22. contrast and compare Bohr's theory and the modern atomic theory. (B)
23. recognize the important subdivisions of the periodic table: periods, groups (families), metals, and nonmetals. (B)
24. use the periodic table to obtain information about an element. (B)
25. describe the spatial arrangement of electrons in an atom within electron shells, subshells, and orbitals. (B)
26. describe the relationship between the electronic structure of an element and its position in the periodic table. (B)
27. specify and diagram the electronic structure of a given element including relative spin of electrons. (B)
28. use values of ionization energies and electron affinities to predict ion formation. (B)
29. use the octet rule to predict the charge of common cations and anions. (B)
30. classify compounds as having ionic, covalent, or polar covalent bonds. (B,C)
31. determine which electrons in an element are valence electrons. (B)
32. write formulas and name ionic compounds for both binary compounds and compounds containing polyatomic ions. (B)
33. write formulas and name binary molecular compounds. (B)
34. name common inorganic compounds using standard conventions and recognize the common names of frequently used substances.(B)
35. predict the differences in physical state, melting and boiling points, solid-state structure, and solution chemistry that result from differences in bonding.(B,C)

36. draw accurate lewis structures for covalent compounds and complex inorganic ions. (B)
37. predict the geometry of molecules and ions using the octet rule and lewis structure. (B)
38. use the principles of VSEPR theory to predict molecular shape. (B)
39. understand the basis for electronegativity and use the concept to predict bond polarity and molecular polarity. (B,C)
40. recognize and demonstrate the relationship between the mole and Avogadro's number, and the usefulness of these quantities. (B)
41. calculate a mole equivalent in grams or atoms or convert grams or atoms of a compound to moles. (A,B)
42. determine the formula mass of a compound. (B)
43. write and balance chemical equations. (B)
44. merge the mole concept and a balanced chemical equation to perform stoichiometric calculations. (A,B)
45. determine the theoretical yield, and the percent yield, of a chemical reaction. (A,B,C)
46. describe the behavior of gases expressed by the gas laws: Boyle's law, Charles's law, Combined gas law, Avogadro's law, the Ideal gas law, and Dalton's law. (A,B,C)
47. use gas laws equations to calculate conditions and changes in conditions of gases. (A,B,C)
48. comprehend the kinetic molecular theory of matter and how it applies to the three physical states. (B,C)
49. demonstrate understanding of the changes of state. (B)
50. describe intermolecular forces in liquids and their relationship to physical properties of liquids. (C)
51. describe the processes of melting, boiling, evaporation, and condensation. (B,C)
52. describe the dipolar attractions known collectively as Van Der Waals forces. (B,C)
53. describe hydrogen bonding and its relationship to boiling and melting temperatures. (B)
54. classify chemical reactions by type: combination, decomposition, single replacement, double replacement, and oxidation-reduction. (B)
55. recognize the various classes of chemical reactions: precipitation, combustion, acid-base, and oxidation-reduction. (B,C)
56. predict the solubility of specific products of a chemical reaction. (B,C)
57. list the properties of a solution. (C)
58. describe the concepts of solubility and saturated solutions. (C)
59. learn to express the concentration of solutions in both percent concentration and molarity, and be able to convert between the two. (A,C)
60. perform dilution calculations. (A,C)
61. describe why the chemical and physical properties of water make it a truly unique solvent. (B,C)

62. correlate the terms endothermic and exothermic with heat flow between a system and its surroundings. (A,B)
63. calculate the energy involved in calorimeter reactions. (A,B,C)
64. describe the concept of reaction rate and the role of kinetics in chemical and physical changes. (B)
65. recognize and demonstrate the factors that influence reaction rates and be able to predict the effect on a particular reaction. (A,B)
66. write an equilibrium constant for a given reversible reaction. (B)
67. understand LeChatelier's principle and its relationship to equilibrium conditions. (B)
68. identify acids and bases and acid-base reactions. (B,C)
69. write equations describing acid-base dissociation and label the conjugate acid-base pairs. (B,C)
70. state the differences between the two acid-base theories. (B)
71. write an equilibrium constant for the ionization of water. (A,B,C)
72. calculate the pH given a value of hydronium/hydroxide ion concentration. (A,B,C)
73. state the meaning of the term buffer and describe the applications of buffers to chemical and biochemical systems, particularly blood chemistry. (B,C)
74. describe the meaning and utility of neutralization reactions. (B,C)
75. provide examples of the importance of pH in chemical and biochemical systems. (B,C)
76. assign oxidation numbers and determine which elements are oxidized and which are reduced. (B)
77. differentiate between the three common types of radiation. (B,D)
78. enumerate the characteristics of alpha, beta, and gamma radiation. (B,D)
79. name each of the three types of radiation affect the mother nuclide and be able to write a balanced equation for the radioactive decay process. (B,D)
80. calculate the amount of radioactive substance remaining after a specified number of half-lives. (A,D)
81. describe the exposure/dose relationship to the clinical effects seen in humans. (D)
82. list selected radionuclides that are used and link them to their respective diagnostic procedure. (D)
83. explain the difference between natural and artificial radioactivity. (B,D)
84. name common techniques for the detection of radioactivity. (D)
85. recognize the common units in which radiation intensity is represented: the curie, roentgen, rad, and rem. (A,D)

Course Requirements

- minimum average of 70% on tests
- homework portfolio (minimum 75% complete)
- minimum 50% on comprehensive final test

Course Grading Scale:

A- 90% or more of total possible points with a minimum average of 70% on tests and a minimum of 75% on the homework portfolio and a minimum of 50% on the comprehensive final test

B- 80% or more of total possible points with a minimum average of 70% on tests and a minimum of 75% on the homework portfolio and a minimum of 50% on the comprehensive final test

C- 70% or more of total possible points with a minimum average of 70% on tests and a minimum of 75% on the homework portfolio and a minimum of 50% on the comprehensive final test

D- 60% or more of total possible points with a minimum average of 60% on tests and a minimum of 75% on the homework portfolio and a minimum of 50% on the comprehensive final test

F- less than 60% of total possible points or less than 60% average on tests or less than 75% on the homework portfolio or less than 50% on the comprehensive final test

Reviewed by K. McNamara/ May 2009